Loss / Near Loss (L/NL)

Loss/Near Loss ID : 23903 **Status :** Closed

Short Description	H2A S/D due to a leak on the startup 450# BFW force circulation line
Responsible Organization	MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)
Loss Type	Loss
Actual Severity Classification (Loss Only)	Level 3a
Potential Severity Classification	Level 3a

Location of Loss/Near Loss	Rich|Hydroprocessing | S Iso | Hydrogen A Train
Date/Time Occurred	10/14/2011 5:15:00 PM
Date/Time Reported	10/14/2011 5:20:00 PM
Process Safety Related Event	No
Type of Activity	Other
Loss/Near Loss Description	Shutdown of H2A Train twice due to a leak on H2A Train forced circulation BFW line during 10/14 startup and on 10/21 due to additional CUI found on intermittent blowdown and forced BFW circulation lines after startup. During start up of H2A Train after an electrical trip (see LI 23898), the 450# BFW forced circulation line leaked on a section of 1.5" horizontal piping. Plant was shut down to inspect/repair leak before proceding. Once this pipe was repaired, the H2A Train startup proceeded, and production resumed. During this time, the CUI group was also beginning inspections to prepare for the H2A Train 1Q2013 Major Turnaround. While inspecting, the CUI group discovered thin piping that was below calculated t-min on the E-305A WHB intermittent blowdown line and E-305C forced circ. BFW line, as well as additional spots on both lines below flag thickness due to CUI. After thin piping was discovered, the decision was made to shut down H2A Train on 10/21 to make piping repairs. At this point, the 4Q2011 unplanned pitstop workscope was executed, including vacuuming of the SCR, replacement of a 24" CO2 flange, and replacement of a 3" natural gas orifice flange. Once repairs were completed, H2A Train resumed H2 production on 10/31.
LPS Alert or Bulletin	No Alert/Bulletin Needed
Immediate Corrective Action Taken	Involved PED, DED, Inspections & Plant Protection in safety discussions. Made decision to pull fires and S/D H2A Train on both occasions to make appropriate piping repairs.
Injury not OSHA-reportable to the Responsible Organization's Site	No
Address 1	
Address 2	
Address 3	
City	
Country	
State/Province	
Zip/Postal Code	
Date Entered	10/15/2011 4:06:03 AM
Entered By	PEREZ, CARLOS (CRCP)

Required for Transportation (MVC) Losses

Weather	Clear
Temperature	32 to <80 F (0 to <27 C)
Lighting	Day

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Loss / Near Loss (L/NL)

Loss Subtypes

Loss

Equipment/Property Damage

Responsibilities

Supervisor/Lead Responsible : WALDROP, JASON - SWAL

Management Sponsor : WALKER, FREDRICK - FRCW

Injury/Illness Coordinator :

Reported By : PEREZ, CARLOS - CRCP

Equipment

Equipment Involved	Critical	Comment
Fixed Equipment: Piping	Yes	H2A Train Waste Heat Boiler Intermittent Blowdown and Forced Circulation Piping

Attachments / Links

Module	ID	Type	File Name / Link	Comment/Description	Upload Date
Investigation	14246	LINK	https://collab001-hou.sp.chevron.net/sites/dsgmfgoe/LPSOut/RIDocLib/23903%20H2A%20BFW%20Piping%20Leak.docx	23903 TapRoot	1/12/2012 12:47:44 PM

Consequences

ID	Type	Party Involved	Status
3235	Equipment/Property Damage		

Consequence - Equipment/Property Damage

Equipment/Property Damage ID : **3235**

Subtypes : Equipment Damage

Description : Piping damage resulting from corrosion under insulation (CUI) on 1.5" WHB forced circulation piping and 2" intermittent blowdown piping.

COI

Required for amounts over $100,000

Revenue (lost production X price) or gross margin (lost product sales - raw materials) impact- US$: 1260000

Expense Impact - Variable Cost, Property Damage, Incremental Costs-US$:

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Loss / Near Loss (L/NL)

Incremental Capital Impact (Portion of Capital Expenditures in lieu of repair or replacement expenses)-US$:

Estimate of Potential Impact to CVX Earnings as Equity Share or Working Interest-After Tax-US$: 806400

Lost Production (BOEG) :

Incident Category : Equipment Failure - Fixed

If other, describe :

What type of equipment initiated the COI incident? : Electrical / Instrumentation(except elect motors)

If other, describe :

Was this Incident Controllable? : Yes

Was this Reliability related? : Yes

Contact Name : Jason Waldrop

Contact Number : 510-242-1331

Journal (Loss/Near Loss)

Personnel	Date	Journal Note	Type
MOREIRA, MARIA (ALVM)	1/10/2012 12:00:00 AM	adjusted COI tab to match data submitted by SBU COI contact	General Note

Investigation

Investigation ID : **14246**

Status : Closed

Investigation Date : 10/21/2011 12:00:00 AM

Type : TapRoot

Sensitive/Commercial : No

Responsibilities

Investigation Team Lead : WOHLGESCHAFFEN, KEN - KRWO

Primary Contact : TORRES, JOHN - JTLD

Management Sponsor : PAK, JOHNNY - JPAK

Reviewer(s) : WALKER, FREDRICK - FRCW

Investigation Team Member(s) : BLUME, DALE - BLUM
WALDROP, JASON - SWAL

Taproot™ Facilitator : WOHLGESCHAFFEN, KEN - KRWO

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Loss / Near Loss (L/NL)

OE Tenets & Processes	
OE Tenets Violated	**Note**
06-Maintain integrity of dedicated systems	
07-Comply with all applicable rules/regulations	
10-Involv rgt ppl when decisions affect proc/equip	
OE Processes Implicated *	**Note**
Management of Change (MOC)	

Root Cause

Root Cause	Factors	Solution / Action Item Id	Solution / Action Item Status	Solution / Action Item Due Date
Work request to remove insulation and replace with personnel protection screen was not executed according to the scope of the work request. (Not able to determine who the person was or why they did not complete the Work Request as written.)	C. Doing the job according to procedures or acceptable practices takes more time/effort: 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following	99740	Closed	2/14/2012 12:00:00 AM
		99746	Closed	2/14/2012 12:00:00 AM
Technical error in the work order process management system, the work order process did not include a hold point whenever an IREC is completed to allow Inspections to verify that it has been carried out according to their specification.	E. Lack of or inadequate procedures: 2-Procedure/acceptable practice exists and is technically wrong and needs improvement	99741	Closed	2/14/2012 12:00:00 AM
Additional Consideration (not a root cause): The MOC Process was not followed for replacing the insulation with personnel protection screens.	C. Doing the job according to procedures or acceptable practices takes more time/effort: 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following	99747	Closed	2/14/2012 12:00:00 AM
Process for submitting an IREC for Routine Maintenance was not followed. A verbal recommendation was given instead of a documented IREC. (Inspector coudl not recall why he chose to not follow the process.)	C. Doing the job according to procedures or acceptable practices takes more time/effort: 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following	99748	Closed	2/14/2012 12:00:00 AM
Categorization process for CUI didn't identify the need to strip insulation based on the more substantial consequences of CUI causing a plant shutdown. Currently the CUI Process only considers enviornmental and safety consequences. It does not consider operational impact and the potential COI.	E. Lack of or inadequate procedures: 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)	99749	Closed	2/14/2012 12:00:00 AM
		99752	Closed	2/14/2012 12:00:00 AM
		99754	Closed	2/14/2012 12:00:00 AM

Solution/Action Item

Solution/Action Item ID : **99740**

Status : Closed

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Loss / Near Loss (L/NL)

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Work request to remove insulation and replace with personnel protection screen was not executed according to the scope of the work request. (Not able to determine who the person was or why they did not complete the Work Request as written.)

Factor : C. Doing the job according to procedures or acceptable practices takes more time/effort : 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following

Solution Type (user entered) : LPS: Personal

Solution : Develop a Reliability Bulletin to review with the Maintenance Planning & Scheduling Group.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 12/13/2011 12:00:00 AM

Action Taken : Reliability bulletin shared wiht the Maintenance Planning & Scheduling group.

V&V Date : 12/13/2011 12:00:00 AM

V&V Comments : Verification=Reliability bulletin shared wiht the Maintenance Planning & Scheduling group via email to Jim Forbes 12/13/2011.

Person Responsible : BLUME, DALE - BLUM

Supervisor/Lead Responsible : TORRES, JOHN - JTLD

Solution/Action Item

Solution/Action Item ID : **99741**

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Technical error in the work order process management system, the work order process did not include a hold point whenever an IREC is completed to allow Inspections to verify that it has been carried out according to their specification.

Factor : E. Lack of or inadequate procedures : 2-Procedure/acceptable practice exists and is technically wrong and needs improvement

Solution Type (user entered) : LPS: Organizational

Solution : Modify the Work Order Process to include a "hold step" whenever an IREC is completed so an email is sent to the Inspector who submitted the Work Order, so they can check the scope has been completed to their satisfaction. To ensure that this hold point is consistently executed, the preference is to prohibit the Work Order from being closed until the Inspector has completed their review.

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Loss / Near Loss (L/NL)

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 1/30/2012 12:00:00 AM

Action Taken : Verified that the OTR group IREC execution process has a hold step to notify inspector when work is completed in it. Also verified that OTR group is following that process and notifying the inspector.

V&V Date : 2/24/2012 12:00:00 AM

V&V Comments : Checked with inspector and OTR group lead - OK on process changes.

Person Responsible : FORBES, JAMES - JFMW

Supervisor/Lead Responsible : PETERSON, JAY - JAYP

Solution/Action Item

Solution/Action Item ID : **99746**

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Work request to remove insulation and replace with personnel protection screen was not executed according to the scope of the work request. (Not able to determine who the person was or why they did not complete the Work Request as written.)

Factor : C. Doing the job according to procedures or acceptable practices takes more time/effort : 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following

Solution Type (user entered) : LPS: Personal

Solution : Remove insulation on the intermittent blowdown piping in H2B and replace it with personnel protective screens.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 3/26/2012 12:00:00 AM

Action Taken : 2/13/12 update: material delivery delayed timely completion of this item. Essie Pineda reports that H2A Train mesh installation is complete, and H2B Train insulation removal is currently in progress. Mesh will be installed as soon as any coating additions are completed on H2B Train
3/9/12 update: Per Essie Pineda, targetting coating completion week of 3/12
3/26/12 - WO 344350 has been completed, and B-Train blowdown lines' inslulation has been removed, lines are coated, and mesh has been installed

V&V Date : 3/30/2012 12:00:00 AM

V&V Comments : Work is complete

Person Responsible : WALDROP, JASON - SWAL

Supervisor/Lead Responsible : PAK, JOHNNY - JPAK

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Solution/Action Item

Solution/Action Item ID : 99747

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Additional Consideration (not a root cause): The MOC Process was not followed for replacing the insulation with personnel protection screens.

Factor : C. Doing the job according to procedures or acceptable practices takes more time/effort : 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following

Solution Type (user entered) : LPS: Personal

Solution : Reinforce that when Work Orders are written for IRECs, MOCs are needed for Work Requests which are not replacement-in-kind.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 11/22/2011 12:00:00 AM

Action Taken : Added paragraph d) to Seciton IV.2 Replacement not in kind. to address the need for MOC when repalcement is not in kiind.

V&V Date : 11/22/2011 12:00:00 AM

V&V Comments : Verification=New paragraph published to the CUI guidelines on hte Maint and Rel web page.

Person Responsible : BLUME, DALE - BLUM

Supervisor/Lead Responsible : TORRES, JOHN - JTLD

Solution/Action Item

Solution/Action Item ID : 99748

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

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Loss / Near Loss (L/NL)

Root Cause : Process for submitting an IREC for Routine Maintenance was not followed. A verbal recommendation was given instead of a documented IREC. (Inspector coudl not recall why he chose to not follow the process.)

Factor : C. Doing the job according to procedures or acceptable practices takes more time/effort : 2-Person chooses to not follow procedure or accepted practice and does not hold themselves accountable for following

Solution Type (user entered) : LPS: Personal

Solution : Reinforce with Inspections the importance of documenting IRECs.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 11/14/2011 12:00:00 AM

Action Taken : Reinforced this issue with FER team lead and received commitment from him to relay the message to his direct reports. I will perform periodic reviews of this when I attend FER team meetings.

V&V Date : 1/13/2012 12:00:00 AM

V&V Comments : Checked in with Inspection Lead and Reliability Manager to test alignment - it was present on using OD on IRECs.

Person Responsible : TORRES, JOHN - JTLD

Supervisor/Lead Responsible : PETERSON, JAY - JAYP

Solution/Action Item

Solution/Action Item ID : **99749**

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Categorization process for CUI didn't identify the need to strip insulation based on the more substantial consequences of CUI causing a plant shutdown. Currently the CUI Process only considers enviornmental and safety consequences. It does not consider operational impact and the potential COI.

Factor : E. Lack of or inadequate procedures : 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)

Solution Type (user entered) : LPS: Organizational

Solution : Modify the CUI Process to use the Risk Threat Prioritization Matrix to categorize CUI consequences. CUI Project is complete for in-plant piping. The next phase is off plot piping. Ensure that COI is included in scoping discussions.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 11/22/2011 12:00:00 AM

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Action Taken : The following paragraph is part of the CUI prioritization process/guidelines.

• These initial consequence classifications can be modified based on other criteria, including impact on plant operation. For example, a line may be categorized as "B/very serious" consequence based on fluid in the piping, but as "A/catastrophic" based on impact of a leak on plant operation (e.g., shut down plant for extended period of time.) This modification of initial consequence categories is based on process engineering or operations input during CUI meetings.

In addition RTP score requirement was added to the "NEW CUI Piping Consequence Catagories"

V&V Date : 11/22/2011 12:00:00 AM

V&V Comments : Verified-COI is part of the analysis guidelines as well as the NEW CUI Piping Consequence Catagories change to include RTP score.

Person Responsible : BLUME, DALE - BLUM

Supervisor/Lead Responsible : TORRES, JOHN - JTLD

Solution/Action Item

Solution/Action Item ID : **99752**

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Categorization process for CUI didn't identify the need to strip insulation based on the more substantial consequences of CUI causing a plant shutdown. Currently the CUI Process only considers enviornmental and safety consequences. It does not consider operational impact and the potential COI.

Factor : E. Lack of or inadequate procedures : 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)

Solution Type (user entered) : LPS: Organizational

Solution : Task the CUI Project to conduct audits of previously analyzed segments deemed Category "D". Start with all boiler systems.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 11/22/2011 12:00:00 AM

Action Taken : CUI project has been tasked to gather all category C and D in plant circuits in a spread sheet by 1/1/2012. When compiled Dale Blume will send to division PED and Ops to revalidate.

V&V Date : 11/22/2011 12:00:00 AM

V&V Comments : Verified-CUI has been tasked

Person Responsible : BLUME, DALE - BLUM

Supervisor/Lead Responsible : TORRES, JOHN - JTLD

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Loss / Near Loss (L/NL)

Solution/Action Item

Solution/Action Item ID : 99754

Status : Closed

Source : Investigation

Source ID : 14246

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Sensitive/Commercial : No

Root Cause : Categorization process for CUI didn't identify the need to strip insulation based on the more substantial consequences of CUI causing a plant shutdown. Currently the CUI Process only considers enviornmental and safety consequences. It does not consider operational impact and the potential COI.

Factor : E. Lack of or inadequate procedures : 4-Procedure/acceptable practice exists and technically right, but needs to be improved (improve clarity, cover additional scenario/steps, etc)

Solution Type (user entered) : LPS: Organizational

Solution : Develop a reliability bulletin and review scenario with reliability BIN group and share vulnerability of CUI on blowdown lines and potential plant impacts.

Date Assigned : 11/14/2011 12:00:00 AM

Due Date : 2/14/2012 12:00:00 AM

Completion Date : 12/13/2011 12:00:00 AM

Action Taken : Reliability bulletin created and forwarded to the FER BIN and other refinery FER Team Leaders.

V&V Date : 12/13/2011 12:00:00 AM

V&V Comments : Verification=Reliability bulletin created and forwarded to the FER BIN and other refinery FER Team Leaders via email 12/12/2011.

Person Responsible : BLUME, DALE - BLUM

Supervisor/Lead Responsible : TORRES, JOHN - JTLD

Stewardship

Loss/Near Loss Quality Review

Quality Review ID : 126244

Status : Closed

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Date Conducted : 12/24/2011 12:00:00 AM

Created Date : 12/24/2011 12:24:05 AM

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Loss / Near Loss (L/NL)

Steward's Additional Comments : A review was conducted on 11/30. Good investigation - reviewed the detailed taproot report which is very well written. Identified the key root causes and appropriate solutions.

Steward (Responsibilities) : HEARNE, NIGEL - HAAI

Results

Item / Name	Result	Comments
1. Writes thorough description of loss/near loss? *	Yes	A detailed review was conducted with the ABM on 11/30. At which time the detailed taproot was reviewed. The investigation report was extremely well wriittend and provided a detailed description of the incident and loss.
2. Identifies root cause(s) by explaining why the near loss or loss occurred? *	Yes	Root causes identified why the losses occurred related to the H2 Train shutdown. There may be other systemic issues asscociated with how IREC recommendations are managed (through maintenance management system) - though this will be handled through further review and V&V.
3. Selects factor(s) from the FSF that matches the root cause? *	Yes	Approprate use of personal and system factors.
4. Develops solution(s) that matches the factor and addresses root cause? *	Yes	Solutions match the root causes.
5. Solution is feasible and maintainable? *	Yes	Follow up work will need to be done on the personal factors associated with personal ownership for IRECs and to establish whether the appropriate risk management is aplied to IRECs of a critical nature. This has been handled and will be covered as part of the V&V.
6. Appropriate reviewers assigned? *	Yes	

Loss/Near Loss Field Verification & Validation

Field V&V ID : **157746**

Status : Closed

Responsible Organization : MFG|RIC|Ops|Hydroprocessing ABU|B Crew(RICREF)

Date Conducted : 4/19/2012 12:00:00 AM

Created Date : 4/9/2012 4:14:23 PM

Steward's Additional Comments : invest ID 14246 V&V

Steward (Responsibilities) : KLASNICH, STEVEN - KLAS

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Loss / Near Loss (L/NL)

Results

Item / Name	Result	Comments
1. Solutions implemented? *	Yes	Yes - verified procedural action and reliability flash by finding these updates on the RIC M&R Web site. screens validated in place. most of the discussion centered around the step added in maximo to ensure planners confirm with Inspectors that IREC's completed as instructed
2. Solutions solve problem? *	Yes	Verified with Inspector that Planners are calling them before closing out work instructions. What was an interesting find is that the prior WO system (passport) had this function and it was carried into new system (Maximo). an MOOC issue?
3. Were process steps followed?	Yes	

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Chevron

Memorandum

To	Johnny Pak – Hydro ABU Manager Frederick Walker – Hydro Section Head
From	Incident Investigation Team: Ken Wohlgeschaffen - Investigation Team Leader Jason Waldrop – SISO Operations Assistant John Torres – Reliability Manager Dale Blume – FER Team Leader
Date	November 10, 2011
Re	Completed TapRooT® Investigation – LI # 14246 IMPACT ERM Loss ID # 23903

Event Title: BFW Line Leak & Thinned Piping

1. Executive Summary:

On October 14, 2011 hydrogen A-train ("H2A") was restarted after loss of the induced draft fan K-305. During the re-start of the plant, a leak was discovered on the 2 inch boiler feed water forced circulation line feeding the E-305 waste heat boilers. The leak was repaired. It was determined to have been caused by corrosion under insulation ("CUI"). Subsequent inspection of the boiler feedwater piping system identified multiple locations which were below the engineering calculated pressure minimum thickness of 0.043 inches due to CUI. Actual thicknesses in two locations measured by RT were as low as 0.020 and 0.030 inches. Upon this discovery, stop work authority was utilized, and the plant was shut down in a safe and controlled manner. The sections of CUI-thinned piping were replaced.

2. Incident Description:

a. Background information

The waste heat boiler blowdown valves in the hydrogen plants have a long history of packing leaks which cause water to collect under insulation resulting in CUI. The valves were replaced during every Major Shutdown. The CUI Program was started in 2006 but the H2 Plants were not included. The long term plan for the refinery was to shut these plants down and replace them with the new Praxair hydrogen plants as part of the Renewal Project. When the Permit to Construct was denied, the plants were again part of the CUI Program.

The boiler feedwater piping was reviewed under the CUI Program by Inspections working with an experienced Operations representative, and the process engineer for the plants. The piping in circuits 7, 8, 9a and 9b were categorized as Consequence "D" (significant), which doesn't require insulation to be stripped for inspection.

In 2007, and again in 2010, IRECs were written for H2B which recommended replacing the boiler feedwater piping due to CUI, removing the insulation on the piping, and installing screens for personnel protection. These recommendations were not followed. The piping was replaced, but the insulation was re-installed. Personnel protection screens were not installed. Additionally, in 2007 verbal instruction was given by Inspections to the Maintenance Efficiency Team during monthly IREC meetings with the SISO OA, IREC Planner, and Inspections, to remove the insulation and install personnel protection screens from the H2A WHB blowdown piping while removing insulation and installing personnel protection screens in H2B. This work did not get completed during the 2010 Major.

b. Incident Description

A-train hydrogen plant tripped off line on October 15, 2011 due to failed insulator on 12kV feeder (LI # 23898 which is being investigated separately). A leak was found on the 2 inch BFW forced circulation line during the subsequent re-start of the plant. It was determined that this leak was caused by CUI as the failure mechanism was corrosion on the outside of the pipe. The leak was repaired. Insulation was removed and the piping was inspected for CUI. This inspection of the boiler feedwater piping system identified multiple locations which were below the engineering calculated pressure minimum thickness of 0.043 inches. Actual thicknesses in two locations measured by RT were as low as 0.020 and 0.030 inches. Upon this discovery, stop work authority was utilized, and the plant was shut down in a safe and controlled manner. Personnel access was restricted while shutting the plant down. The sections of CUI-thinned piping were replaced.

3. Incident Consequences

H2A was shut down for ten days. This resulted in a loss of hydrogen and an COI of $500M. The consequences were not as bad as they would have been because RLOP was shut down for a Major Turnaround. Additional advantage was taken of the Shutdown by performing maintenance work on a leaking vapor line on the inlet to the CO2 stripper condenser E-335, and cleaning of the R-305 SCR catalyst .

4. Root Causes & Corrective Actions:

CAUSAL FACTOR #1:

Work Request to remove insulation and replace with a personnel protection screen was not executed according to the scope of the work request.

ROOT CAUSE #1

Human performance difficulty, Maintenance did not follow the work request (exact reason unknown).

CORRECTIVE ACTION #1

Develop a Reliability Bulletin to review with the Maintenance Planning and Scheduling group.

Owner: Dale Blume Due Date: February 14, 2012

ROOT CAUSE #2

Technical error in the work order process management system, the work order process did not include a hold point whenever an IREC is completed to allow Inspections to verify that it has been carried out according to their specification.

CORRECTIVE ACTION #2

Modify the work order process to include a "hold step" whenever an IREC is completed so an email is sent to the Inspector who submitted the work order, so they can check that the scope has been completed to their satisfaction. To ensure that this hold point is consistently executed, the preference is to prohibit the work order from being closed until the Inspector has completed their review.

Owner: Jim Forbes Due Date: February 14, 2012

CORRECTIVE ACTION #3

Remove insulation on the intermittent blowdown piping in H2B and replace with personnel protective screening.

Owner: Jason Waldrop Due Date: February 14, 2012

Note WR # 344350 has been submitted by Dale Blume and approved.

ADDITIONAL CONSIDERATION #1

The MOC Process was not followed for replacing the insulation with personnel protective screens. Reinforce that when Work Orders are written for IRECs, MOCs are needed for Work Requests which are not replacement-in-kind.

Owner: Dale Blume Due Date: February 14, 2012

CAUSAL FACTOR #2

Process for submitting an IREC for routine maintenance was not followed. A verbal recommendation was given instead of a documented IREC.

ROOT CAUSE

Human performance difficulty - IREC Process was not followed by the Inspector who can't recall exactly why, back in 2007, he did not document the IREC.

CORRECTIVE ACTION #3

Reinforce with Inspections the importance of documenting IRECs.

Owner: John Torres Due Date: Complete

CAUSAL FACTOR #3

Categorization process for CUI didn't identify the need to strip insulation based on the more substantial consequences of CUI causing a plant shutdown. Currently the CUI Process only considers environmental and safety consequences. It does not consider operational impact and the potential COI.

ROOT CAUSE

Technical error in the CUI Categorization Process.

CORRECTIVE ACTION #4

Modify the CUI Process to use the Risk Threat Prioritization Matrix to categorize CUI consequences. CUI Project is complete for in-plant piping. The next phase is off plot piping. Ensure that COI is included in scoping discussions.

Owner: Dale Blume Due Date: February 14, 2012

CORRECTIVE ACTION #5

Task the CUI Project to conduct audits of previously analyzed segments deemed Category "D". Start with all boiler systems.

Owner: Dale Blume Due Date: February 14, 2012

CORRECTIVE ACTION #6

Develop a reliability bulletin and review scenario with reliability BIN group and share vulnerability of CUI on blowdown lines and potential plant impacts.

Owner: Dale Blume Due Date: February 14, 2012

References & Attachments:

Appendix 1 : TapRooT® Events, Causal Factors & Root Causes Chart

Appendix 2 : IRECs & Work Requests, Isometric Diagrams showing Pipe Thickness Measurements

Appendix 3 : Leak Photographs

7.Additional Information:

Type of Incident *(From II&R Matrix)*:

Incident Level: 3a Potential Incident Level: 3a

Management Sponsor:

Johnny Pak – RBM, Hydroprocessing Division

Tenets Followed:

Always...

2) Operate in a safe, secure and controlled condition

8) Address abnormal conditions

Tenets Compromised:

Always...

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6) Maintain integrity of dedicated systems

7) Comply with all applicable procedures, rules and regulations

10) Involve the right people in decisions that affect procedures and equipment

OE Processes Compromised:

Management of Change

Report Approved by, Position & Date:

Reviewed and approved by Johnny Pak, Hydroprocessing ABU Manager 11/10/11.

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Appendix 1 : TapRooT® Events, Causal Factors & Root Causes Chart

O:\All\Pmo\H2 Plant PMO\PED Files\Incidents & Issues\2011 H2A BFW Piping Leak\Timeline.xlsx

Pre-2006	2006	Dec.2007	Jul.2010	Oct.2010	10/13/2011
WHB blowdown valves have a long history of packing leaks, which result in CUI.	CUI Project Kicked Off at Richmond Refinery	PPWR 28125219 issued to replace H2B piping & install personnel protective screens due to CUI.	Permit to Construct Renewal Project is denied. CUI Program is re-started for H2B 1Q11 Major.	CUI Inspections for 2011 H2B Major wrote Reco 89739 to replace b/d piping & install PP Screens.	CUI Group removed insu recommended by PED-C inspection for H2A2013 I
Valves are replaced during every H2 plant Major S/D.	H2A & H2B were not included, as plants were going to go away with Renewal Project.	PPWR 2812519 is completed. Piping is replaced. Insulation is replaced, screens aren't installed.	CUI Project assigns circuits 7,8,9a, 9b as Consequence "D", doesn't require insulation to be stripped.	H2B forced circulation piping replaced between block valves.	Inspections was advisec mirror of H2B. H2A CUI F by Ops-PED copies H2B I
		Inspections also gives a ***verbal*** Reco to do the same for H2A: replace piping & install screens.	Categorization as Consequence "D" (Significant) is appropriate based on Non-API, > 140F	Reco 89739 is completed during 2011 Major but the insulation is re-installed.	Inspections did visual,sa some damage of insulat insulation. RT'd suspect and removed insualtion
		The IREC is not followed. Piping is not replaced. Insulation is not removed and replaced w/screens.	CF3-Categorization Process didn't identify the need to strip insulation based on consequence.		
		CF1-Work Request not completed.	Visual Inspection of H2B piping shows no evidence of damage, or need to remove insulation since it was replaced in 2007.		
		CF2-Process for IREC not followed.			

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Appendix 2 : IRECs & Work Requests, Isometric Diagrams showing Pipe Thickness Measurements

REC-67216.pdf

REC-89739.pdf

H2A Thin Boiler Piping 10-21-11.pdf

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Appendix 3: Leak Photographs